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INCOME SMOOTHING - METHODOLOGY AND MODELS

by

O. Douglas Moses

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This study investigates methodology used to investigate income smoothing by business firms. Three important researcher methodological decisions used in past empirical studies of income smoothing (design type, smoothing device norm, and income target) are discussed and evaluated. Each of the three decisions is found to have a significant effect on the operationalization and measurement of income smoothing behavior. The identification of smoothing, and consequently the conclusions to be drawn from smoothing studies, is found to be sensitive to the three methodological choices.

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INCOME SMOOTHING RESEARCH - METHODOLOGY AND MODELS

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CONTENTS

INTRODUCTION

Over twenty years ago Hepworth (1953) hypothesized that firms might use the flexibility allowed by accounting principles and techniques to reduce the amplitude of periodic net income fluctuations - in other words to "smooth" net income. Hepworth and various other researchers suggested several reasons why smoothing behavior would be beneficial to managers. The first empirical investigation concerning smoothing actions by management was conducted by Gordon, Horwitz and Meyers (1966). Since that time numerous empirical tests of the income smoothing hypothesis have been conducted, based on various assumptions, and achieving various degrees of conclusiveness.

The purpose of this paper is a) to review the methodology used in past empirical studies of income smoothing with the goal of highlighting the procedures used to operationalize the concept of smoothing, and b) to empirically investigate the extent to which results of smoothing studies may vary depending on the manner in which smoothing is operationalized.

BACKGROUND

Smoothing Defined

Smoothing can be defined as the adjustment of reported income figures with the purpose of reducing the periodic fluctuations in that series. Smoothing may be accomplished by either artificial means (selection or use of accounting procedures which do not require a real economic transaction) or real means (engaging in a transaction that has real economic consequences).[1] Furthermore smoothing may be "visible," in the sense that management's actions are disclosed (e.g., the choice of the deferral vs flowthrough method of recording the investment tax credit) or

[1] While artificial and real smoothing are (conceptually) distinct, empirically the effects of artificial and real smoothing may be difficult to isolate. Whether or not to engage in a transaction and how that transaction will be recorded may be a concurrent decision on the part of a firm's management. (Dascher & Malcolm, 1969).

invisible (e.g., revision of the useful life estimate for a depreciable asset).

Smoothing research was first pursued in an attempt to explain what motivates management's selection and use of alternative accounting procedures (Gordon, Horwitz & Meyers, 1966). Ideally, two firms with identical economic situations should issue identical financial statements. However, there exists sufficient choice among accounting alternatives (e.g., straight line vs accelerated depreciation) and sufficient flexibility in applying accounting procedures (e.g., subjective estimates of fixed assets' useful lives) that the income reported by two "identical" firms could differ substantially and still be in accordance with generally accepted accounting principles. Consequently, income as reported in financial statements is at least partly a function of the manner in which management uses the discretion allowed by currently accepted accounting principles. Given that accounting principles are sufficiently flexible to present management with the opportunity to "adjust" reported income, what determines how management will use that capability?

In an attempt to explain management choice, several authors (Beidleman, 1973; Gagnon, 1967; Gordon, 1964; Hepworth, 1953; Monsen and Downs, 1965) argue that a primary goal of managers is to report a steadily increasing series of earnings over successive periods (i.e., to smooth income).[2] Furthermore, Kane (1973) hypothesizes that managers are even willing to sacrifice real profits for the mere appearance of stability or low variability in the reported earnings series. Many arguments why managers may be motivated to smooth income have been suggested (for a further discussion, see appendix I). Most arguments claim that managers act in their own self-interest, and that the reporting of an earnings series characterized by low variability will effect the behavior of various groups (owners, creditors, investors, government, employees) in a manner which is ultimately beneficial to

[2] Alternative goals of management have also been hypothesized. The traditional hypothesis of management behavior is that managers will attempt to maximize reported earnings (Gagnon, 1967). Baumol (1958) however suggests that managers will try to maximize sales, not earnings. Simon (1957) sees managers as satisficers rather than maximizers.

management.

With smoothing as a hypothesized goal of management several questions become of interest. Do managers actively attempt and succeed in smoothing income? Are artificial or real techniques (or both) employed? Are artificial techniques perceived as artificial by the users of accounting information? Does smoothing affect the behavior of users?[3] Does smoothing affect a firm's systematic or unsystematic risk? Does smoothing affect the price of a firm's stock?[4] Does smoothing prove beneficial to managers? Are resources more (or less) efficiently allocated if income numbers are smoothed?[5]

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[3] One particular group whose actions are of interest to accountants is investors - as represented in the aggregate by the securities market reaction to accounting information. From the point of view of the effect of smoothing on securities prices, artificial smoothing may be of little interest. The efficient markets hypothesis suggest that artificial smoothing will have no effect (assuming there is sufficient disclosure to detect it). From the point of view of investigating management behavior and goals, artificial smoothing still remains of interest. Recent evidence (Mayer-Sommer, 1979) suggest that the understanding and acceptance of the efficient markets hypothesis is not wide spread. Artificial smoothing may be practiced under the (erroneous) assumption that it makes a difference. Furthermore while the securities market may be assumed to be efficient with respect to artificial smoothing techniques, whether or not other users of accounting information (e.g., creditors, labor) can be affected by artificial smoothing remains an open question. Real smoothing, on the other hand, would be expected to impact on securities prices and this area remains open for investigation.

[4] Biedleman (1973) has argued that smoothing may be practiced in an attempt to "counter the cyclical nature of reported earnings and thereby reduce the correlation of a firm's expected returns with returns on the market portfolio. To the degree that autonormalization of earnings is successful and that the reduced covariance of returns with the market is recognized by investors and incorporated into their valuation processes, smoothing will have added beneficial effects on share values." (p. 654) The results of Lev and Kunitzky (1974) suggest that the smoothness of earnings are correlated with both systematic and overall common stock risk measures.

[5] A goal of accounting is to provide information that is useful for predicting the future cash flows of a firm (FASB, 1978). Resource allocation in the securities market is based on share prices. Share prices are based on investor assessment of the value of the firm which is contingent on expected future cash flows. To the extent that accounting numbers are used and affect investor predictions of cash flows, income smoothing has implications for resource allocation. Recent work (Barnea, Ronen & Sadan, 1976; Ronen, Sadan & Snow, 1977) argues a motivation for smoothing may be to provide investors with an income stream that is efficient in predicting future cash flows. If smoothing does provide a more efficient signal, enhanced predictability could lead to a lowered risk assessment and a beneficial effect on share prices. In this respect artificial smoothing (as well as real) could have content for the market - not because it reflects a real transaction, but because it constitutes a signal about future cash flows (Horwitz, 1977).

Numerous empirical studies of smoothing have been conducted (see Ronen, Sadan, and Snow, 1977, for a summary). Both artificial and real smoothing has been investigated. Yet while the smoothing hypothesis was first articulated over twenty years ago, research has not progressed much past addressing the question of whether smoothing appears to be practiced. Research has not fully addressed the effects of smoothing behavior - whether or not smoothing (artificial or real) makes a difference, and to whom. A major reason for not examining smoothing effects has been the difficulty of operationalizing the concept of smoothing. A premise of this paper is that the possible impact of smoothing cannot reasonably be investigated until the concept of smoothing becomes adequately defined operationally. The next section of thi paper reviews how smoothing has been operationalized in past empirical studies. The remainder of the study investigates how some of the methodological assumptions and techniques that have been employed in operationalizing smoothing may effect the results of smoothing studies.

Past Empirical Studies

The past studies have all followed a similar research process (Figure 1). All were expost studies and included the following steps:

1. A smoothing technique(s) or instrument(s) was hypothesized. For example, Gordon, Horwitz, and Meyers (1966) suggested that the choice of the accounting treatment for the investment tax credit (flow through vs. deferral) might be made with an attempt to smooth income. Several researchers have argued what they feel are the necessary attributes of a smoothing instrument (Beidleman, 1973; Copeland, 1968; Cushing, 1969; Gagnon, 1967; White, 1970). Generally a smoothing instrument must be some accounting procedure choice, some management decision which takes advantage of the flexibility allowed by an accounting system, or some actual transaction, which is within management's discretion and shifts income between reporting periods.

2. An income measure was identified. Most studies have looked at the Net Income or EPS measure, while some have looked at Ordinary Income (Barnea, Ronen, Sadan, 1976; Ronen & Sadan, 1975).

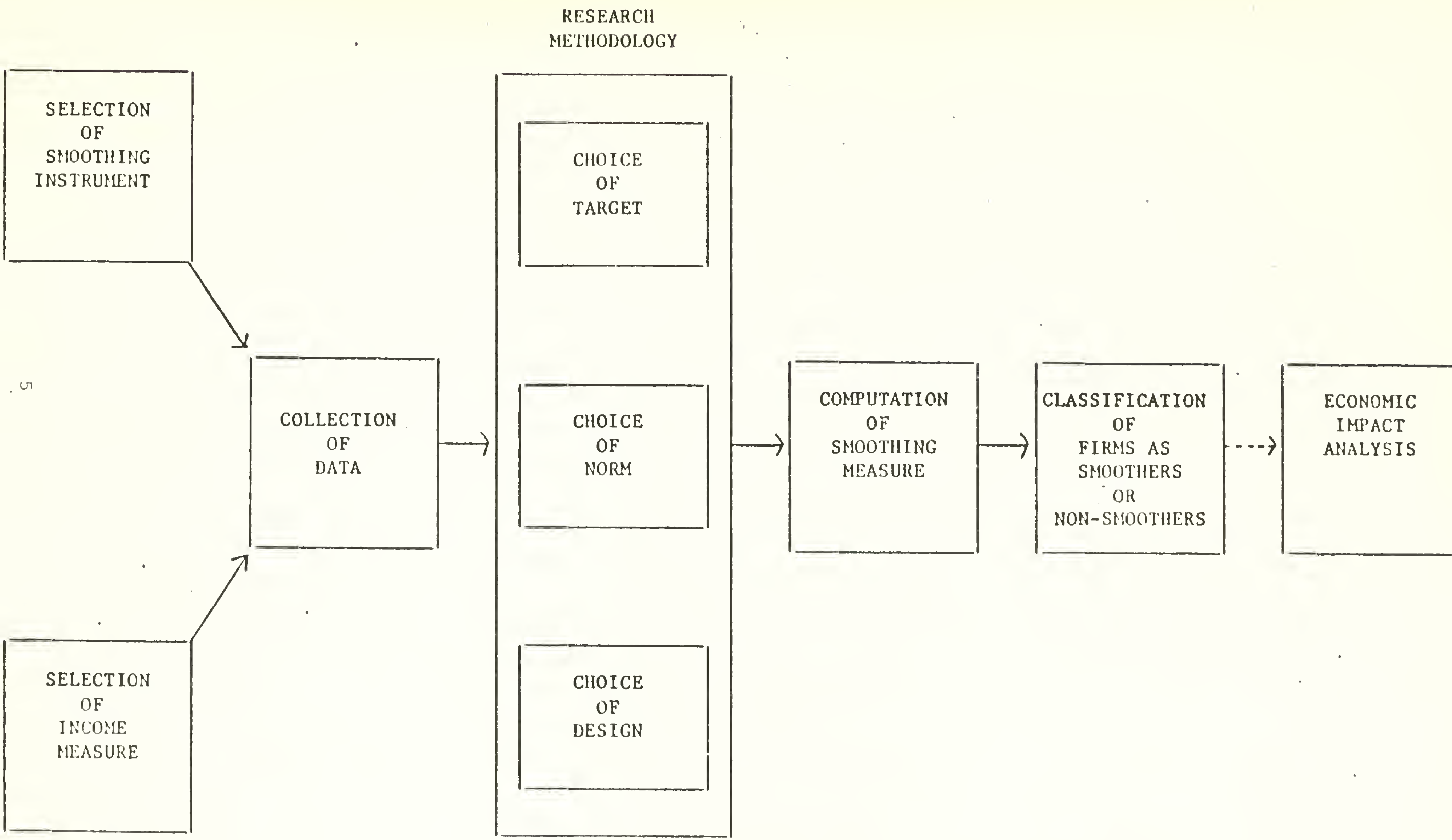
3. A sample of firms was selected and published financial data on income and on the smoothing instrument was collected.

4. A methodology was developed in order to investigate the impact of the smoothing instrument on the variability of the income measure.

5. Measures of the impact of the smoothing instrument on income variability were generated.

FIGURE 1

DIAGRAM OF THE RESEARCH PROCESS USED
IN EMPIRICAL STUDIES OF INCOME SMOOTHING



6. Firms were classified as "smoothers" if the smoothing instrument tended to reduce income variability and "non-smoothers" if income variability was increased. General conclusions were drawn about the incidence of smoothing behavior based on the relative proportion of firms classified as smoother or non-smoothers.

Past studies have primarily asked if smoothing is practiced. They have not as yet answered the question of whether smoothing has an effect, but ultimately, if smoothing is practiced, its economic impact needs to be investigated and some past studies have indicated impact research as being the next step.

Past Methodologies

While the general research process is similar among the smoothing studies, the specific methodologies have differed. Basically three separate choices were made (either explicitly or implicitly) by past researchers:

1. Choice of target income.
2. Choice of smoothing instrument norm.
3. Choice of design type.

Target Income. Researchers face a problem in answering the following question: If managers do attempt to smooth income, toward what target income are they aiming? What income pattern do they desire to achieve? Smoothing implies a dampening of fluctuations in reported income. The question of a target is methodologically important because researchers have analyzed the fluctuations in income by measuring the variability of reported income relative to some target. Researchers have been forced to hypothesize a target or a pattern of income which they assume firms desire to achieve. Firms have been classified as smoothers (or non-smoothers) on the basis of the variability of their reported income series relative to the target. Consequently the classification of firms is necessarily dependent on the target assumed. While various theories of the firm, theories of management behavior, and theories of how reported earnings affect stock prices exist, they have not provided smoothing researchers with a definitive target or income patter toward which managers might be expected to adjust income.

Different researchers have used different criteria for defining a target income

number. Some early studies (Archibald, 1967; Copeland, 1968; Copeland & Licastro, 1968; Gagnon, 1967) simply assumed that firms would attempt to replicate the prior year's income. Thus, if income was above last year, managers would attempt to smooth downward, and vice versa. A recent study (Ball & Watts, 1972) indicated ex post facto that the previous year's income may in fact be the best starting point for prediction of net income, but no evidence has surfaced which indicates that managers merely attempt to duplicate the previous year's income. Praiseworthy management performance is usually considered to include a bettering of the previous year's performance, thus an argument can be made that management would aim for a target above previous years' income.

Various other researchers have used time related models to set target figures. Gordon et al. (1966) and Cushing (1969) developed their own measures defining target income by an arbitrary weighting of several prior years' income. Barefield and Comiskey (1972), Barnea et al. (1976), Beidleman (1973), and White (1970) all used least squares regression lines to predict target income. The income predicted by the regression line fit to the actual stream of income was assumed ex post to be the target toward which firms attempted to smooth. Still others, including Beidleman (1973) and Dascher and Malcom (1970) have used semi-logarithmic and exponential models to generate targets. Ronen and Sadan (1975) used a submartingale model which predicts target income primarily on the basis of the previous year's income. Models using the reported income of other firms have also been used to generate targets. For example Barnea, Ronen, & Sadan (1976) assumed that firms in a given industry would try to duplicate the pattern of income exhibited by the "leading firm" in that industry. While Ronen and Sadan (1975), assumed that firms would try to follow the income pattern exhibited by an aggregate index of income of all firms in a given industry.

Defining target income has been an important step in past studies, yet the justification for using various models has been intuitive rather than theory-based. Smoothing researchers have agreed on one thing: that smoothing implies a dampening

of fluctuations of reported income. And they have analyzed the fluctuations in income by measuring variability relative to some target. But there has been little agreement on what target, and therefore problems in operationalizing the concept of variability.

Smoothing Instrument Norm. Smoothing is usually viewed as the adjustment of income through the use of some discretionary choice by management. For example a firm could attempt to adjust income upward by spending less for R & D in a given year and adjust downward by spending more for R & D in another year. The question for the smoothing researcher is how much of the R & D expense is to be considered discretionary? If the researcher assumes that a zero level of R & D expense is the "norm", then he will use the full amount of R & D expense reported in any given year as the appropriate quantity to use in assessing the impact of R & D on income variability. Alternatively, the researcher could assume that some average level of R & D expense (over a period of years) is normal. In that case the portion of R & D that a firms management has discretion over would be represented by deviations from the average; and those deviations would be the appropriate quantities for the smoothing researcher to use in assessing the impact of R & D on income variability. Most smoothing researchers have implicitly assumed a zero norm. Some have assumed an average (Barnea, Ronen, & Sadan, 1976). Other norms have also been used. For example, Ronen & Sadan (1975), while investigating the smoothing effects of extraordinary items, assumed that extraordinary items for a firm would follow the aggregate pattern of extraordinary items exhibited by the firm's industry as a whole. Thus deviations from the industry pattern were the measure used to assess the effect of extraordinary items on income variability. Regardless of the norm assumed, deviations from that norm have been treated as the quantities whose impact on earnings was assessed.[6]

[6] It should be noted that the issue of a smoothing instrument norm is not always relevant. Some research has looked at the smoothing consequences of the choice between two accounting alternatives - e.g. flowthrough vs. deferred methods of treating the investment tax credit. Where such a choice between two discrete alternatives is investigated, the issue of a norm is moot. However when the smoothing consequences of an instrument that can vary continuously across a range is investigated, a norm must be implicitly or explicitly assumed.

Design. As has been previously stated, the empirical research of the smoothing question has been of the ex post type using financial data from published sources. The design is a process which takes the raw data on both income and the smoothing instrument for an individual firm and, taking into consideration the assumed target and norm, reduces the raw data in some manner which indicates whether or not the particular firm appears to have smoothed its recorded income. The designs which have been used in past studies are of three basic types: a) cross-sectional, b) regression - standard error, and c) regression - correlation.

Within the cross-sectional (CS) design, the reported income number(s) from the preceding year(s) are used to predict or set a target for the year that is being investigated. Then, if the effect of the smoothing instrument was to move the actual reported income closer to the target than would have been the case if the smoothing instrument had not been present, the firm is classified as a smoother (and vice versa). The essence of the cross-sectional design is that the target is a function of the preceding year(s) reported income, that a target is set for each year that is being investigated, and that each year is treated separately as an individual observation.

The regression - standard error design, on the other hand, treats several years of income figures for each firm as a single observation. Generally a stream of income for several years is detrended using one of many possible target income patterns. For example if the researcher assumes that firms desire to achieve a smooth linear time trend in reported income, then the reported income series could be regressed against time and the residuals calculated. The trend line is assumed to be the target and the residuals are analyzed to assess variability relative to the target.

The regression - standard error design follows from Gordon (1966) who suggested a possible test for income smoothing:

For each firm, fit a curve to a stream of income over several years calculated in two ways: (1) excluding the effects of the possible manipulative variable; and (2) including the effects of the manipulative variable. If the variations of the observations around the curve are smaller in the latter case, income smoothing has been a consequence of transactions in the account. (p. 223)

The essence of the Gordon approach is that it focuses on two series of income (with and without the smoothing instrument included) and compares the variability of the two income series. The standard error of the estimate (SDE) is frequently used to measure variability about the trend line, hence this approach can be termed the regression - standard error design (RS).[7]

The regression - correlation (RC) design was first used by Beidleman (1973). The RC design also considers several years of income figures for each firm as a single observation. Beidleman detrended the reported income series (using some target pattern) and detrended the smoothing instrument series (using some norm). Residuals from the two series were associated via correlation to determine if smoothing had occurred. For example, if a firm attempted to smooth income via research and development expense, one would expect to observe above normal R & D expense in years in which there was above target income. Thus a positive correlation between R & D expense residuals and income residuals would be consistent with smoothing behavior. The essence of the RC design is that it focuses on one income series and one smoothing instrument series, rather than two income series. (Details of how particular targets, norms and designs are operationalized will be elaborated on in a later section of this paper.)

Background Summary.

It is clear from the research process employed that the findings of past

[7] Other measures of variability about the trend line could and have been used. For example Barefield and Comiskey (1972) used the mean square error. The SDE has been used more frequently, however. All studies which use this basic approach of comparing the variability of the two income streams are referred to as RS designs in this paper.

studies are at least in part a function of the choices made by the researchers. The targets and norms assumed and the designs used have varied from study to study (Table 1). Any attempt to view past empirical studies as a coherent body of research - and consequently be able to draw conclusions on the incidence of smoothing behavior and begin to investigate its impact - is necessarily based on an assumption that the past studies are all testing the same phenomenon, and that the different methodologies used are merely different ways of operationalizing the construct of smoothing. However, if different methodologies result in significantly different findings (using the same raw data) then one must conclude that the findings are a result of the methodologies used. Just as beauty is in the eyes of the beholder, smoothing may be in the methodology used to investigate it. Ronen, Sadan and Snow (1977) have previously suggested that smoothing studies may be affected by the target models used. The results of White's study (1970) seem to reinforce this idea. But a systematic look at the effects of different methodologies has not been conducted.

The remainder of this paper reports on a study which looks at the effect of the methodology used in smoothing research on the findings of the research. A research process analogous to that outlined in figure 2 was followed: A potential smoothing instrument was identified. An income measure was selected. A target and a smoothing instrument norm were assumed. A choice of design was made. Smoothing measures were generated and firms were classified as smoothers or non-smoothers. The process was systematically repeated numerous times under several assumed targets, several assumed norms, and different designs. The findings under the varying assumptions and procedures were compared. The basic research question underlying the study was:

> What is the effect of target selection, norm selection, and design selection on the findings of smoothing research?

Table 1

SUMMARY OF METHODOLOGY USED IN PAST STUDIES

STUDY	DESIGN	TARGET	NORM
Archibald (1967)	CS	- preceding year's earnings	- zero
Barefield & Comiskey (1972)	RS	- linear time trend	- zero
Barnea, Ronen & Sadan (1976)	RC	- linear time trend - industry leader trend	- average
Beidleman (1973)	RC	- linear time trend - log time trend	- linear time trend - log time trend
Copeland (1968)	CS	- preceding year's earnings	- zero
Copeland & Licastro (1968)	CS	- preceding year's earnings	- preceding year's reported amount
Cushing (1969)	CS	- preceding year's earnings + growth factor	- zero
Dascher & Malcom (1970)	RS	- exponential curve	- zero
Dopuch & Drake (1966)	CS	- unspecified	- unspecified
Gagnon (1967)	CS	- preceding year's earnings	- zero
Gordon, Horwitz & Meyers (1966)	CS	- exponential weighting of prior year's earnings	- zero
Imhoff (1977)	RS	- linear time trend	- zero
Ronen & Sadan (1975)	RC	- industry index trend - preceding year plus growth factor	- industry index - average
White (1970)	CS	- preceding year - linear time trend - log time trend	- zero

NATURE OF THE CURRENT STUDY

The Smoothing Instrument - Marketable Securities Transactions

Prior to FASB No. 12, most firms recorded the value of marketable securities at cost, although some firms used the lower-of-cost-or market rule. The AICPA stated that

> Where market value is less than cost by a substantial amount and it is evident that the decline in market value is not due to a mere temporary condition, the amount (of marketable securities) to be included as a current asset should not exceed market value .... (Accounting Research and Terminology Bulletins, Final Edition; 1961, p. 23)

(FASB No. 12 now requires the use of lower-of-cost-or market for valuing marketable securities which reduces but does not eliminate the smoothing potential of securities transactions.)

The result of recording marketable securities at cost is that when market prices increase significantly above cost values, a firm in effect builds up a reserve which can be realized as revenue through the sale of the securities. Management can determine the period in which the gain will be reported. If firms desire to smooth reported income, securities can be held or sold on the basis of the resultant effect on reported income. The period in which the value of a given security changes need not coincide with the period in which that change in value is realized and included in the calculation of net income. The cost basis of recording and the recognition of revenue at the time of sale allow management a certain flexibility in revenue realization. Consequently, revenue from the appreciation of marketable securities is discretionary in nature and a potential smoothing technique.

The decision to investigate marketable securities transactions as a potential smoothing instrument is based on several considerations:

1. As just discussed, there is strong a priori reason to believe that marketable securities transactions have smoothing potential. (See also Kane, 1973.)

2. In addition to a priori arguments of smoothing potential, there is empirical evidence that "the cost basis (of recording marketable securities) does result in the creation of reserves which might be used to influence reported income" (Dopuch & Drake, 1966).

3. A decision to sell securities involves a real transaction. Past research has investigated both "real" smoothing (where a real transaction is involved) and "artificial" smoothing (where only an accounting entry is involved with no cash flow consequences). Most empirical research into smoothing has looked at artificial smoothing, but the more conclusive empirical results have tended to follow from investigations of real smoothing (Beidleman, 1973; Dascher & Malcom, 1969). This is interesting in light of another study (Lev & Kunitsky, 1974) which showed an association between real smoothing of a firms income and the market risk of that firm's stock.

The real versus artificial distinction is also important with respect to the efficient markets hypothesis which suggests that an attempt to smooth income by artificial means will have no effect on stock prices (assuming sufficient information in the public domain to deduce the effects of the artificial smoothing technique on reported income numbers).

4. As previously mentioned, the issue of assuming a smoothing instrument norm is not relevant to the testing of all smoothing instruments. The level of gains and losses resulting from marketable securities transactions, however, can vary over some continuous range; and consequently a norm must be assumed. Because a norm must be assumed, the effect of assuming different norms can be investigated.

5. The primary accounting effect of a decision to sell securities (i.e. recognition of a gain or loss) impacts income for one year only. Some previous studies have been criticized because decisions which affected income for several years were investigated, but the impact of those decisions on all years effected was not assessed. Because gains or losses from securities transactions effect income for one year only, the methodological problem of trying to assess multiple-year consequences of the decision is avoided.[8]

Data Base

The commercial banking industry was deemed an appropriate area in which to test for income smoothing via marketable securities gains and losses. The banking industry was selected for several reasons: (a) it was believed that substantially all firms in the banking industry hold marketable securities and consequently a

[8] It can be argued that the selling of a security results in the sacrifice of interest or dividends in future periods. However, evidence (Kane, 1973) suggests that within the banking industry the secondary effect of future interest or dividends is of relatively little concern in a decision to sell securities compared to the recognition of gains or losses. The recognition of a gain or loss is discretionary on the part of managers while the recording of future interest or dividends is beyond their immediate control.

sufficiently large sample of firms could be developed; (b) a preliminary perusal of annual reports of commercial banks indicated that gains and losses from security transactions were sufficiently material as to be of some importance; and (c) there is substantial a priori reason to believe that banks may attempt to smooth income via security transactions (see Kane, 1973).

A list of banks was generated from Fortune's list of the 50 largest commercial banking firms. A sample of 40 firms was selected. (Original data gathering for this study was completed while the author was a student at SDSU. Selection of the 40 firms was based on the availability of annual reports at SDSU. See appendix II for a listing of sample firms.)

Annual reports were accessed to collect data on two series: (a) reported Net Income[9] and (b) Gains and Losses from marketable securities transactions. Data on reported net income and gains and losses from securities transactions was collected for the five year period 1970-1974. This period was considered appropriate to investigate because (1) a change in the tax law applicable to security gains and losses occurred in 1969. Prior to 1969 gains and losses were taxes at different rates resulting in a "penalty" to firms that offset gains and losses in the same tax year. The changed tax law gave banks more flexibility in engaging in securities transactions for smoothing purposes (Kane, 1973). (2) FASB No. 12, restricting the accounting treatment of securities gains and losses, became effective December 1975. Thus 1970-74 embraces the period when the smoothing potential of securities transactions for banks was relatively high.

Target Income

Six different targets were looked at, each involving a different assumption

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[9] Measures of Ordinary Income or Operating Income, used in other studies, were considered irrelevant because Gains and Losses from securities transactions are not added into Ordinary or Operating Income in the banking industry.

about the pattern or level of income desired by managers. (The targets are operationalized differently depending on the design used. Operationalizing the targets is discussed in a later section of this paper.) The assumptions underlying each of the six targets are as follows:

1. Linear Time Trend. Target 1 assumes that managers desire a pattern of income that has low variability relative to a linear time trend.

2. Industry Trend. Target 2 assumes that firms desire a pattern of income which approximates the pattern exhibited by the industry as a whole. Variability is measured relative to an industry trend line.

3. Leader Trend. Target 3 assumes that firms desire a pattern of income which approximates the pattern exhibited by the industry leader. The industry leader is used as a surrogate for the industry as a whole.

4. Preceding Year's Earnings. Target 4 assumes that firms attempt to replicate the preceding year's reported earnings figure.

5. SYD Growth. Target 5 assumes that firms attempt to meet a target based on the preceding year's reported income plus a growth factor. The growth factor is based on a sum-of-the-years-digits weighting of growth over several prior periods.

6. Average Growth. Target 6 assumes that firms attempt to meet a target based on the preceeding year's reported income plus a growth factor equal to the average growth over several prior periods.

Smoothing Instrument Norm

As previously discussed a normal level for the smoothing instrument (gains and losses from securities transactions) must be assumed. It is the deviations from the norm which are considered to be discretionary and consequently it is the deviations whose effect on reported income is important. Four different norms were investigated:

1. Zero. Norm 1 is zero and thus assumes that the full amount of reported gains or losses from securities transactions in any given year is discretionar

2. Average. Norm 2 is the average level of gains and losses reported for the 5 year period of the study. Deviations from this average are assumed to be the discretionary portion of gains and losses.

3. Linear Time Trend. Norm 3 assumes that gains and losses follow a linear time trend. The norm for any given year is the amount predicted by a trend line fit to the 5 year gains and losses series. Deviations from the trend

are considered discretionary.

4. Industry Trend. Norm 4 assumes that gains and losses for an individual firm follow the same pattern as an industrywide index of gains and losses. Deviations from such an industrywide trend are treated as discretionary.

Designs[10]

Ultimately the function of the different types of designs discussed in this paper is to take the raw data on income and securities transactions for an individual firm and, taking into consideration the assumed target and norm, reduce that raw data to some "smoothing" measure which indicates whether or not the particular firm appears to have smoothed its reported income. In this study a smoothing measure was developed for each of the three designs. The measures developed are designed to reflect the "impact" of gains and losses from securities transactions on income variability. Impact here means the relative decrease (increase) in income variability due to the effect of gains and losses from securities transactions, or the strength of association between gains and losses and net income. The three measures developed and used in this study have the following properties:

a) Each reflects the effect of the smoothing instrument on income variability.

b) Each is similar to measures used in the smoothing literature.

c) Each takes on positive values when smoothing behavior is indicated and negative values when non-smoothing behavior is indicated. The classification of firms as smoothers (non-smoothers) follows directly from the sign of the smoothing measure.

The following sections discuss how the three smoothing measures were developed from the three designs, as well as how the various targets and norms were operationalized under each design. All targets were not investigated under each design. A summary of which targets and norms were investigated under each of the designs follows the design discussion.

[10] Some limitations of the designs used in this paper are presented in appendix III.

Cross-sectional Design (CS) As previously discussed, the cross-sectional type designs used in past smoothing studies focus on the effect of the smoothing instrument on income for one year. The most recent year from the data, 1974, was investigated. The smoothing measure was developed as follows:

Define:

- Y = actual reported net income for a given firm for 1974.
- T = target income hypothesized for 1974.
- S = actual reported gains or losses from securities transaction for 1974.
- N = the norm for securities gains and losses hypothesized for 1974.
- D = $S - N$ = the deviation of the reported gains and losses from the hypothesized norm.
- Y' = $Y - D$ = reported net income with the effects of the discretionary portion of gains and losses removed, henceforth called presmoothed income.

The smoothing measure used was

$$\left|T - Y'\right| - \left|T - Y\right|$$

The meaning of this measure can best be explained by example. Assume a firm's target income (T) was \$100. Assume that its actual income figure (Y) was \$104. If securities transactions (S) resulted in a loss of \$2 and all of that loss was assumed discretionary (i.e. norm (N) = 0) then presmoothed income (Y') would have equaled \$106. The smoothing measure calculates the extent to which the discretionary portion of securities gains and losses (S) moves income (Y) closer to the target (T) than would have been the case if gains and losses from securitie transactions was not present. $|100 - 106| - |100 - 104| = 2$ i.e. the effect of securities transactions was to shift reported income \$2 closer to the target. Conceptually this represents the change in the deviation of actual income from target income due to the effects of the smoothing instrument.

Targets used in the cross-sectional design were developed for each firm individually as follows:

T_1 = The income predicted for 1974 by a least squares linear regression line fit to the 1971-1974 reported income series for the individual firm.

$$T_2 = Y_{1973} \times \left(\frac{M_{1974}}{M_{1973}}\right)$$

where M is an industry index of reported net income calculated by adding the net incomes of all firms in the sample (excluding the individual firm whose target is being generated).

$$T_3 = Y_{1973} \times \left(\frac{L_{1974}}{L_{1973}}\right)$$

where L is the actual reported net income of the industry leader (Bank of America).

$T_4 = Y_{1973}$ = actual reported income for the individual firm for 1973.

$$T_5 = Y_{1973} + .5\ (Y_{1973} - Y_{1972}) + .333\ (Y_{1972} - Y_{1971}) + .1667\ (Y_{1971} - Y_{1970})$$

$$T_6 = Y_{1973} \times \left(\frac{Y_{1973}}{Y_{1972}} + \frac{Y_{1972}}{Y_{1971}} + \frac{Y_{1971}}{Y_{1970}}\right) \div 3$$

Norms were operationalized as follows:

N_1 = zero

$N_2 = (S_{1974} + S_{1973} + S_{1972} + S_{1971} + S_{1970}) \div 5$

N_3 = the value predicted for 1974 by a least squares linear regression line fit to the 1970-1974 series of S for each firm individually.

N_4 = the S series for each firm was regressed (using least squares linear regression) against an industry index of securities gains and losses (calculated by adding the gains and losses in each year for all firms in the sample excluding the individual firm under consideration). The value predicted for 1974 by the regression equation was assumed to be the norm.

Each combination of a design, a target and a norm will be referred to as a model. Each of the six targets were combined with each of the four norms. Thus 24 cross-sectional models were developed and a smoothing measure was generated for

each of the 40 sample firms using each model.

Regression - Standard Error Design. The following procedure was followed in arriving at a smoothing measure for the RS design:

Define:

Y = the actual reported income series (1970-1974) for an individual firm

T = the target income series (i.e. the pattern of income hypothesized to be the target)

S = the actual reported securities gains and losses series (1970-1974) for an individual firm.

$Y' = Y - S$ = presmoothed income series (1970-1974)

Steps:

a) Y was regressed against T (using ordinary least squares linear regression). The standard error of the estimate was computed (SDE_Y)

b) Y' was regressed against T. The standard error was computed. ($SDE_{Y'}$)

c) The smoothing measure was calculated as $SDE_{Y'} - SDE_Y$.

The interpretation of this measure is analogous to the interpretation of the cross-sectional measure. It represents the improvement in variability due to the effects of the smoothing instrument.

Targets were operationalized as follows:

T_1 = the series 1, 2, 3, 4, 5. (i.e. a constant linear time trend was the assumed target pattern.)

T_2 = an industry income series calculated by summing the reported net incomes each year for all firms in the sample (excluding the firm whose target pattern is being set).

T_3 = the reported income series for the industry leader (Bank of America).

Norms were operationalized as follows:

N_1 = a constant (zero)

N_2 = a constant: $(S_{1974} + S_{1973} + S_{1972} + S_{1971} + S_{1970}) \div 5$

N_3 = the series 1, 2, 3, 4, 5.

N_4 = an industry series of gains and losses from securities transactions (calculated by summing the gains and losses for all sample firms for each year - excluding the individual firm being investigated).

All combinations of the three targets and four norms just outlined were tested under the RS design, for a total of 12 models.

Regression - Correlation Design. The following procedure was used in arriving at a smoothing measure for the RC design.

Define:

Y = the actual reported income series (1970-1974) for an individual firm.

T = the target income series

S = the actual reported securities gains and losses series (1970-1974) for an individual firm.

N = the series of gains and losses hypothesized to be the norm.

Steps:

a) Y was regressed against T using ordinary least squares regression. The residuals were calculated. (Designated series R_Y)

b) S was regressed against N. The residuals were calculated. (Designated R_S)

c) R_Y was correlated with R_S.

d) The resulting correlation was multiplied by -1.

This correlation was used as the smoothing measure. The implicit argument is that if smoothing is practiced then above trend (norm) securities gains and losses will be associated with below trend (target) income, and vice versa. Thus smoothing behavior would be consistent with a negative correlation between residuals. The higher the negative correlation, the stronger the smoothing association indicated. The correlation was multiplied by negative one to make its sign consistent with the smoothing measures developed under the other designs.

Targets were operationalized as follows:

T_1 = the series 1, 2, 3, 4, 5.

T_2 = an industry income series (calculated analogously to T_2 under the RS design)

T_3 = the reported income series for the industry leader, Bank of America.

Norms were operationalized as follows:

N_1 = a constant (zero)

N_2 = a constant: $(S_{1974} + S_{1973} + S_{1972} + S_{1971} + S_{1970}) \div 5$

N_3 = the series 1, 2, 3, 4, 5.

N_4 = an industry series of gains and losses from securities transactions (calculated by summing the gains and losses for each year for each sample firm - excluding the individual firm being investigated).

All combinations of the three targets and four norms just outlined were tested under the regression - correlation design, for a total of 12 models.

Table 2 summarizes the combinations of targets, norms and designs investigated. Some targets were not tested under the RS and RC designs because investigation of those targets would have required income data prior to 1970 which was unavailable at the time the data collection phase of this research was conducted.

Comparison of Models. As Table 2 indicates a total of 48 different models were investigated. Each model generated a smoothing measure for each of the 40 sample firms. Thus each firm was classified as a smoother or non-smoother using each model. Several questions were then addressed.

1) Do different models lead to different classification of firms as smoothers or non-smoothers?

2) If different models do lead to different classifications, what choice (selection of target, norm or design) is most critical in inducing different classifications?

3) Which specific targets, norms or designs cause models to classify firms differently than the remaining targets, norms or designs? (More specifically, can targets, norms, or designs which are "outliers" be identified? For example does the use of norm No. 1 in a model lead to classifications which are different from those generated by models using the remaining norms 2, 3 and 4?)

Table 2

MODELS INVESTIGATED

TARGETS

FORMS	Linear Time Trend	Industry Trend	Industry Leader	Preceding Years' Income	Preceding Year + SYD Growth	Preceding Year + Average Growth
Zero	CS RC RS	CS RC RS	CS RC RS	CS	CS	CS
Five Year Average	CS RC RS	CS RC RS	CS RC RS	CS	CS	CS
Linear Time Trend	CS RC RS	CS RC RS	CS RC RS	CS	CS	CS
Industry Trend	CS RC RS	CS RC RS	CS RC RS	CS	CS	CS

DESIGNS

CS - Cross-sectional
RS - Regression - SDE
RC - Regression - Correlation

Do Different Models Lead to Different Classifications?

The classification of sample firms as smoothers or non-smoothers generated under each model was compared with the classification generated under every other model. This resulted in 1128 pairwise comparisons of models. A contingency table was developed for each comparison.

		CLASSIFICATION GENERATED FROM MODEL j	
		SMOOTHER	NON-SMOOTHER
CLASSIFICATION GENERATED FROM MODEL i	SMOOTHER	A	B
	NON-SMOOTHER	C	D

Cell A would contain the number of firms which were classified as smoothers by both model i and model j. Cell D would contain the number of firms classified as non-smoothers by both models. Cells B and C would contain the firms classified as a smoother on one model and a non-smoother on the other. If two models classified firms similarly then one would expect most of the 40 firms to fall into cells A and D. A high number of observations in cells A and D relative to cells B and C would suggest a high association between the two models. An observation in either cell B or C represents a change in how a firm was classified (as a smoother or non-smoother) with a change in the model. The average number of

classification changes over the 1128 pairwise comparisons was 14.9. The median number of classification changes was 15.7. The number of classification changes ranged from zero (perfect association between models) to 26 (poor association between models).

The significance of the association between any two models can be tested by a chi-square test. A chi-square test of association assumes no association between models. The null hypothesis of no association can be rejected for significantly high chi-square values. The expectation was that if different models resulted in substantially the same classification of sample firms, then large (significant) chi-square values would be observed. Poor association between models would be indicated by low chi-square values. All comparison involved 40 observations and df = 1.

Of the 1128 pairwise comparisons 277 (24.6%) resulted in chi-square values in excess of 6.635 which is significant at the α = .01 level. Thus the null hypothesis of no significant association was rejected for 277 comparisons. The null hypothesis failed to be rejected for the remaining 851 (75.4%) cases. These findings suggest that there is substantial disagreement among the models in classifying firms as smoothers or non-smoothers. A way to interpret these results is to assume that a researcher had selected (randomly) one of the 48 models developed in this study, and assume that he switched (randomly) to some other model. The probability that the two models produced significantly similar classifications of firms as smoothers or non-smoothers would be about 1 in 4.

<u>What is the Critical Researcher Choice?</u>

The results just described suggest that there is the possibility of substantial disagreement among models if the researcher changes his assumed target, assumed norm, or design type. The question of which of these three choices is

more likely to effect the classification of firms was addressed next.

The 1128 pairwise comparisons were broken into three subsets: those which resulted in a chi-square value in excess of 6.635 ($\alpha = .01$) were termed the "high" association group (277 cases). Those that resulted in a chi-square value of less than 3.841 ($\alpha = .05$) were termed the "low" association group (759 cases). Those whose chi-square values fell between 3.841 and 6.635 were termed borderline and dropped from subsequent analysis (92 cases).

Discriminant analysis (Tatsuoka, 1970) was used to analyze and distinguish between those pairwise comparisons which were in the highly associated group and those in the low group. More specifically, a discriminant function was developed as follows:

$$Z = B_1 D + B_2 T + B_3 N + B_4 DT + B_5 DN + B_6 TN + B_7 DTN$$

WHERE

Z = Discriminant score

B_i = the standardized coefficients of the corresponding variables (weights)

D = a dummy variable with value of +1 if the two models being compared differ in their design type and 0 if they use the same design

T = 1 if the models differ in targets and 0 if the models assume the same target

N = 1 if the models differ in norm and 0 if the models assume the same norm

DT = 1 if the models differ in both design and target, 0 otherwise

DN = 1 if the models differ in both design and norm, 0 otherwise

TN = 1 if the models differ in both target and norm, 0 otherwise

DTN = 1 if the models differ in design, target and norm, 0 otherwise.

A discriminant function is a linear combination of the independent (discriminating variables. The purpose of discriminant analysis is to find the particular function that maximally discriminates between groups. An analysis of the coefficients of the discriminating variables can then be used to address the question of which variables contribute most to the separation between the

two groups.[11]

In the current context, the observation that a particular discriminating variable contributes to separation of the groups means that the difference in models represented by that variable was important in determining whether the two models being compared would be of high or low association. For example if variable T was found to contribute significantly to group separation, then one would conclude that whether or not two models differed in their assumed targets is important in determining whether or not those two models are highly associated, i.e., classify firms in a similar manner.

A hierarchical stepwise procedure (SPSS, 1975) was used in developing the discriminant function.[12] Variables D, T and N were allowed to enter the discriminant function first in order of their capacity to discriminate between the high and low groups. Variables DT, DN and TN were allowed to enter after D, T and N if they provided additional information about group differences. Variable DTN was allowed to enter only if it provided information about group differences not already contained in D, T, N, DT, DN, or TN. Table 3 shows the results of the discriminant analysis. Five of the seven variables were found to contribute to group discrimination. The standardized coefficients (ignoring signs) are frequently interpreted as a measure of the relative importance of each variable in explaining group differences (SPSS, 1975). Recent work (Joy & Tollefson, 1975) has suggested that the standardized discriminant

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[11] In theory discriminant analysis requires that the discriminating variables have a multivariate normal distribution and that there be equal variance - covariance matrices within each group. Those conditions are not met here but the findings are still believed useful both because the discriminant technique is robust and because subsequent analysis tended to produce findings which are consistent with those from the discriminant technique.

[12] Two alternative entry criteria, Wilks and Rao (SPSS, 1975), were used and found to produce the same results. A hierarchical stepwise procedure was used because of high multicolinearity between the primary variables D, T, N and the various interaction terms. D, T, and N were not significantly correlated.

Table 3

DISCRIMINATING VARIABLES

VARIABLE	ORDER OF ENTRY	STANDARDIZED COEFFICIENT (B_1)	JOY AND TOLLEFSON CONTRIBUTION MEASURE
D	1	1.96	1.56
T	2	0.69	0.29
N	3	1.12	0.42
DT	4	−0.40	−0.34
DN	5	−1.26	−0.77

Canonical correlation = 0.517

Wilks' Lambda = 0.7325

Chi square (measure of significance of Wilks' lambda) = 321.03

Chi square value significant at α = .001

% of cases correctly classified = 80.12%

coefficients are not the best measure of contribution, and that are more relevant measure can be calculated by multiplying the unstandardized coefficients by the difference between group centroids for each variable. This measure of contribution is also presented in table 3.

Several findings are suggested by table 3. The discriminant function resulted in a Wilks lamda value which was significant at the α = .001 level. Thus the function does have explanatory significance. Knowledge of the characteristics of the two models in each pairwise comparison would have permitted accurate classification of the comparison (high or low association) about 80% of the time.

The presence of variables D, T and N in the function suggests that a change in a model's design, target or norm may be sufficient to produce a significantly different classification of firms as smoothers or non-smoothers. Thus all three researcher choices are important.

More significantly for the purposes of the current study, is that a critical choice seems apparent. On both measures of relative contribution, variable D is dominant and should be considered of primary importance in development of a smoothing model. Of secondary importance, variable N appears to contribute more to group discrimination than variable T. This suggests that models may be more sensitive to a shift in the assumed norm than in the assumed target.

Are Specific Designs, Target or Norms "Outliers"?

The third question to be addressed asked if specific designs (or targets or norms) appear to result in smoothing/non-smoothing classifications which are different from the classifications generated from models using other designs (or targets or norms). The rationale behind this question is that of convergent validity (Kerlinger, 1973). Ultimately a researcher would desire to have a

model which reproduces "reality". In other words the model would classify a firm as a smoother (non-smoother) if and only if the firm was in truth a smoother (non-smoother). Agreement with reality would be the test of validity of the model. Since ex post smoothing researchers have no true classifications with which to validate models, an alternative concept of validity seems appropriate. Convergence argues that if several different procedures for measuring some attribute lead to similar results, then the similarity of results is evidence that the different procedures are validly measuring the desired attribute. Within the present context, this suggests that if some specific design, target or norm leads to results which differ from those produced when other designs, targets or norms are used, then the validity of that specific design, target or norm is placed in doubt.

Designs: Since the choice of design was found to be more critical than the choice of target or norm, designs were investigated first. All pairwise model comparison where the models differed in design type were isolated. This resulted in 677 pairwise comparisons between models that differed in design. As there were only three possible designs (CS, RS, RC), three types of design comparisons resulted: CS/RS, CS/RC, RS/RC. Each of these comparisons could result in models which were higly or lowly associated (i.e. fell into the high or low groups previously defined on the basis of chi-square scores). Table 4 is a contingency table which relates the nature of the design comparison with the level of association achieved.

Table 4
Contingency table showing the relationship between the types of designs present in model comparisons and the level of model association achieved.

Type of design comparison		Level of Association: LOW	HIGH
	CS/RS	274	2
	CS/RC	284	0
	RS/RC	15	102

The significance of the relationship presented in table 4 was tested using a chi-square test of association (df = 2). The resultant chi-square value of 561.2 was significant at $\alpha = .0001$. Cramer's V (SPSS, 1975), a measure of association which can take on values from 0 to +1 was .91. Clearly there is an association between the type of designs compared and the resultant observation that the models were or were not highly associated. The findings are relatively clear. The classifications of firms as smoothers or non-smoothers produced by the CS design are poorly associated with the classifications produced by both the RS and RC designs, while the RS and RC designs produce classifications that tend to be well associated with each other.

The results presented in table 4 involve comparisons of models which may differ in target and norm as well as design. To control for differences in targets or norms, the above process was repeated for those model comparisons where designs differed but targets and norms were the same (35 cases). The results are presented in table 5 and confirm the previous findings:[13] the CS design tends to produce classifications which differ from those produced with the RS or RC designs.

Table 5

Contingency table showing the relationship between the type of designs present in model comparisons and the level of model association achieved. (Targets and norms controlled)

Type of Design Comparison		Level of Association: LOW	HIGH
	CS/RS	12	0
	CS/RC	11	0
	RS/RC	0	12

chi-square = 34.9
significance α = .0001
Cramers V = 1.0

13 While an analysis which controls for differences in targets or norms is theoretically more correct, controlling for confounding variables reduces sample size which intensifies a small cell size problem and causes chi-square values to be less meaningful. In this and later sections of the paper findings under both uncontrolled and controlled conditions are presented because they tend to confirm each other and because small cell sizes are more frequently observed under the controlled conditions.

Norms. As the assumption of a norm was previously found to be the second most important choice, the association between models assuming different norms was investigated next. Because design types were seen to have a significant effect on firm classification, norms were investigated separately within the context of each of the three designs. Table 6 presents contingency tables relating the types of norm present in model comparisons with the level of model association achieved. (All models used the CS design.) The left hand side of table 6 ignores target differences. The right hand side controls for target differences by displaying only those cases where the models being compared have identical assumed targets.

Both sides of table 6 tell essentially the same story. Chi-square values are significant suggesting that there is a relationship between the type of norms compared and the resultant observation that the models were or were not highly associated. Cases of low association predominate when models assuming a linear norm (N3) are compared with models assuming any of the other norms. This result is particularly noticeable when targets are controlled for. Thus norm 3 appears to be an outlier when used in the CS type design.

Another finding is also suggested by table 6. Whether or not target differences are controlled, the column totals indicate that, overall, cases of low association far outnumber cases of high association. Apparently even when all models use the same (CS) design, there exists considerable disagreement on how they classify firms. Models using the CS design are quite sensitive to a change in norm. Furthermore, a comparison between the column totals found under uncontrolled conditions with those found under controlled conditions indicates a significantly[14] larger number of low association cases when targets are not controlled. Thus if two CS models differ in target as well as norm, there exists

[14] A t test for the significance of difference between two sample proportions (Richmond, 1964) was significant at $\alpha = .001$.

TABLE 6

CONTINGENCY TABLE SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF NORMS PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED

(CS DESIGN)

TARGETS NOT CONTROLLED (n = 190)

TYPE OF NORM COMPARISON		LEVEL OF ASSOCIATION: LOW	LEVEL OF ASSOCIATION: HIGH
	N1/N2	28	3
	N1/N3	35	0
	N1/N4	24	1
	N2/N3	36	0
	N2/N4	11	16
	N3/N4	36	0
	TOTALS	170	20

CHI SQUARE = 81.8

SIGNIFICANCE α = .0001

CRAMER'S V = 0.55

TARGETS CONTROLLED (n = 30)

TYPE OF NORM COMPARISON		LEVEL OF ASSOCIATION: LOW	LEVEL OF ASSOCIATION: HIGH
	N1/N2	1	3
	N1/N3	6	0
	N1/N4	1	1
	N2/N3	6	0
	N2/N4	0	6
	N3/N4	6	0
	TOTALS	20	10

CHI SQUARE = 81.8

SIGNIFICANCE α = .0002

CRAMER'S V = 0.67

TABLE 7

CONTINGENCY TABLE SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF NORMS PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED

(RS DESIGN)

TARGETS NOT CONTROLLED (n = 44)

TYPE OF NORM COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
N1/N2	0	9
N1/N3	0	9
N1/N4	1	4
N2/N3	0	9
N2/N4	1	4
N3/N4	2	5
TOTALS	4	40

TARGETS CONTROLLED (n = 16)

TYPE OF NORM COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
N1/N2	0	3
N1/N3	0	3
N1/N4	0	2
N2/N3	0	3
N2/N4	0	2
N3/N4	0	3
TOTALS	0	16

CHI SQUARE = 7.35

SIGNIFICANCE α = 0.20

TABLE 8

CONTINGENCY TABLE SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF NORMS PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED
(RC DESIGN)

TARGETS NOT CONTROLLED (n = 50)

TYPE OF NORM COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
N1/N2	0	9
N1/N3	0	9
N1/N4	2	7
N2/N3	0	9
N2/N4	2	7
N3/N4	0	5
TOTALS	4	46

CHI SQUARE = 7.73

SIGNIFICANCE α = 0.17

CRAMER'S V = 0.37

TARGETS CONTROLLED (n = 17)

TYPE OF NORM COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
N1/N2	0	3
N1/N3	0	3
N1/N4	0	3
N2/N3	0	3
N2/N4	0	3
N3/N4	0	2
TOTALS	0	17

a higher probability that they will be poorly associated.

Tables 7 and 8 present a similar analysis of norm differences within the context of the RS and RC designs respectively. Within both designs, there was no significant relationship between the type of norms compared and the level of association achieved. No outliers are strongly indicated. In fact when target differences were controlled for, there were no cases of low association between models. The column totals suggest that models using the RS and RC designs are considerably less sensitive to changes in the norm assumed than are models using the CS design.

Targets. Lastly target comparisons were investigated - again separately for each design. Six different targets were assumed under the CS design. Taken pairwise there are 15 combinations of targets which can be compared. Table 9 presents contingency tables relating target comparisons with the level of model association achieved (with and without control for norm differences between models). Without control for norm differences the relationship between target comparisons and level of association is just significant at $\alpha = .05$, but no clear pattern of agreement or disagreement between targets is apparent.

Controlling for norm differences reveals that there is a relationship between targets and level of association, although further interpretation is difficult. A comparison of models tended to result in low association when T3 was present in the comparison (i.e. when one of the models assumed a target based on the industry leader.) However this was clearly not the case for all comparisons involving a T3 model, thus it does not appear safe to conclude that T3 is an outlier.

A more interesting result is indicated by a comparison of the column totals between the controlled and uncontrolled conditions. The fact that a) there were relatively few cases of low model association when norms were controlled and that

TABLE 9

CONTINGENCY TABLE SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF TARGETS PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED (CS DESIGN)

NORMS NOT CONTROLLED (n = 211)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
T1/T2	9	6
T1/T3	15	0
T2/T3	9	6
T1/T4	9	4
T1/T5	8	5
T1/T6	10	5
T2/T4	10	2
T2/T5	11	4
T2/T6	9	4
T3/T4	16	0
T3/T5	12	1
T3/T6	12	4
T4/T5	9	6
T4/T6	10	1
T5/T6	8	6
TOTALS	157	54

CHI SQUARE = 24.00

SIGNIFICANCE α = .046

CRAMER'S V = 0.34

NORMS CONTROLLED (n = 51)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
T1/T2	0	4
T1/T3	3	0
T2/T3	0	4
T1/T4	0	4
T1/T5	0	4
T1/T6	0	4
T2/T4	0	2
T2/T5	0	4
T2/T6	0	4
T3/T4	4	0
T3/T5	0	1
T3/T6	0	4
T4/T5	0	4
T4/T6	0	1
T5/T6	0	4
TOTALS	7	44

CHI SQUARE = 50.99

SIGNIFICANCE α = .0001

CRAMER'S V = 0.71

TABLE 10

CONTINGENCY TABLES SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF TARGETS PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED (RS DESIGN)

NORMS NOT CONTROLLED (n = 40)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION	
	LOW	HIGH
T1/T2	3	10
T1/T3	2	9
T2/T3	0	16
TOTALS	5	35

CHI SQUARE = 3.94

SIGNIFICANCE α = 0.14

CRAMER'S V = 0.31

NORMS CONTROLLED (n = 12)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION	
	LOW	HIGH
T1/T2	0	4
T1/T3	1	3
T2/T3	0	4
TOTALS	1	11

CHI SQUARE = 2.18

SIGNIFICANCE α = 0.34

CRAMER'S V = 0.42

TABLE 11

CONTINGENCY TABLES SHOWING THE RELATIONSHIP BETWEEN THE TYPE OF TARGET PRESENT IN MODEL COMPARISONS AND THE LEVEL OF MODEL ASSOCIATION ACHIEVED (RC DESIGN)

NORMS NOT CONTROLLED (n = 45)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
T1/T2	2	13
T1/T3	2	12
T2/T3	0	16
TOTALS	4	41

CHI SQUARE = 2.43

SIGNIFICANCE α = 0.30

CRAMER'S V = 0.23

NORMS CONTROLLED (n = 12)

TYPE OF TARGET COMPARISON	LEVEL OF ASSOCIATION: LOW	HIGH
T1/T2	0	4
T1/T3	0	4
T2/T3	0	4
TOTALS	0	12

b) a significantly[15] larger proportion of low association cases are observed when norms are not controlled suggests that models differing in both norm and targets are more likely to be poorly associated and that norm differences may be more important than target differences. This finding is consistent that provided by the discriminant analysis and table 6.

Tables 10 and 11 present a similar analysis of targets within the context of the RS and RC designs. Since only three targets (T1, T2, T3) were investigated under the RS and RC designs, only three comparisons were possible (T1/T2, T1/T3, T2/T3). Within both designs there was no significant relationship between the type of targets compared and the level of association achieved. In fact, with the exception of one case, when norm differences were controlled for, there were no cases of low association between models. The column totals indicate that models using the RS and RC designs are less sensitive to a change in the assumed target than are models using the CS design.

SUMMARY & CONCLUSIONS

This paper has attempted to do two things: 1) to review the research process used to research income smoothing, and 2) to empirically address some issues concerning the role of model selection in influencing the findings of past smoothing research.

The review suggested that ex post smoothing researchers have made three choices: a) selection of an income target toward which firms are assumed to smooth, b) selection of a smoothing instrument norm which determines the portion of the smoothing instrument assumed to be discretionary; and c) selection of a design which operationalizes the concept of smoothing and generates a classification

15 A t-test for the significance of difference between two sample proportions (Richmond, 1964) was significant at α = .001.

of firms as smoothers or non-smoothers. While target selection has been discussed in previous work (Ronen, Sadan & Snow, 1977) and design issues have been addressed throughout the smoothing literature, the role of norm selection has not been previously highlighted. Norms have often been implicitly assumed without justification in previous work. This is important because the empirical portion of this study suggests that the selection of a norm may be a more critical choice on the part of a researcher than selection of a target.

The empirical portion of this paper investigated the effect of the choice of targets, norms and designs on the findings of smoothing research. Three questions were addressed: 1) Do models which differ in target, norm or design lead to different results? 2) Which researcher choice is most critical? 3) Are there specific targets, norms or designs which appear to be "outliers"?

Several conclusions are suggested: First, there seems to be no doubt that different models can lead to significantly different classifications of firms and consequently different results. For over 75% of the pairwise comparisons between models investigated in this study, the finding was that the models were not significantly associated. The 75% figure may overstate[16] the case but it seems clear that the findings of smoothing research are significantly dependent on the models assumed.

Second, while the choice of a target, norm or design can all influence results, the selection of a design type appears to be the most critical decision smoothing researchers have made.

Third, the results generated from models using the CS design differ substantially from the results generated from the RS or RC designs. The RS and RC designs tend to generate results that are well associated with each other.

[16] There were more CS than RS or RC models involved in the analysis. This coupled with the fact that 1) CS models were poorly associated with RS or RC models, and 2) CS models were more sensitive to changes in targets or norms suggests that the 75% overstates the case.

Fourth, the selection of target or norm appears to be more important in conjunction with the CS design than either the RS or RC designs. A change of assumed target or norm was most likely to result in low association between models if those models used a CS design. The CS design appears more sensitive than the RS or RC designs to changes in target or norm.

The conclusions of this study must be tempered with several limitations. The empirical portion of the study was conducted within a narrow context. One specific industry was sampled (commercial banking). One specific smoothing instrument was investigated (securities transactions). One specific income measure was selected (net income as reported in published financial statements). And only one specific five year period was involved (1970-74). In some respects this paper is analogous to a case study. The effect of using different models was investigated within one particular environment. Furthermore, this investigation did not encompass all models that have been used in past research. In spite of the limitations just mentioned, there seem to be two important implications for viewing past research or conducting future ex post research on smoothing.

First, a smoothing model needs more than face validity for there to be confidence in the results it generates. The models used in past smoothing studies have generally had high face validity, yet the results of this study show that alternative (superficially valid) models can lead to significantly different results. Future research should make a greater effort to tie model selection to theory, or should make an effort to validate models using some notion of convergent validity.

Second, the fact that there was such clear disagreement between the CS and the RS or RC type models raises the question of whether they are investigating the same aspect of the smoothing phenomenon. A short review of how the designs operationalized the construct of smoothing provides some insight. Generally

the CS design used income data from prior years (1970-73) to predict a target income figure for 1974. If the effect of the smoothing instrument was to move actual reported income closer to the target than it would have been in the absence of the smoothing instrument, the firm was classified as a smoother. In other words the firm is classified on the basis of its apparent attempt to achieve a target in one year.

Both the RS and RC designs made no predictions. They merely detrended an income series and evaluated the ex post effect of the smoothing instrument on income variability. Thus when using the RS or RC design, the firm is classified on the basis of its apparent achievement of lowered income variability.

Two different aspects of smoothing may be being investigated. If one accepts that smoothing is a multi year phenomenon (i.e., reducing the variability of a series of income figures) then the CS design seems to ask the question "Do firms appear to try to smooth income?", while the RS and RC designs seem to ask the question "Do firms appear to succeed in smoothing income?" If future research is concerned with the behavioral question of whether smoothing is attempted, a cross-sectional design might be appropriate. If future research is concerned with the accomplishment of a smoothed income series, then an RS or RC design would be more appropriate. In any event, past research should be viewed and future research conducted with these two different aspects of smoothing in mind.

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Appendix I

HYPOTHESIZED BENEFITS OF SMOOTHING BEHAVIOR

1. Tax Benefits. If tax rates change from year to year, it is to managements benefit to shift income to years in which the tax rate is relatively lower. If management compensation is tied to company profits and management experiences a progressive tax structure, then the smoothing of income will result in a lower overall personal tax being paid (Hepworth, 1953).

2. Dividend Policy. Stable earnings facilitates a stable dividend policy. Stable dividends will increase investor satisfaction with management (Hepworth, 1953). If management policy call for a fixed level of dividend payout, a less variable income allows that fixed level to be high (Ronen, Sadan and Snow, 1977).

3. Industrial Relations. Abnormally high profits may lead to strong demands on the part of labor for wage increases. Abnormally low profits, however, will seldom lead to wage decreases. Consequently, it is beneficial to management to avoid excessively profitable years by smoothing income (Hepworth, 1953).

4. Market Psychology. Psychological factors are an important element in the determination of overall economic activity. Smoothing income could control the expectations of business participants and reduce the effect of excessive optimism or excessive pessimism on the level of business activity. Thus smoothing would result in an improved overall better business climate (Hepworth, 1953).

5. Performance Measurement. Income is used as a measure of management performance. Excessively poor years may lead to stockholders rebellion and management ouster while excessively good years don't usually lead to corresponding rewards. There is an asymmetry between the results of failure and success (Johnson, 1966; Monsen and Downs, 1965).

6. Stockholder Utility. Stockholders have diminishing marginal utility for corporate income. Smoothing income leads to higher overall utility on the part of stockholders (Gordon, 1964).

7. Public Image. A smoothed income stream serves to create a public image of competence and also avoids controversy (Monsen & Downs, 1965). Such stability and lack of controversy would be beneficial in not arousing regulatory interest.

8. Budgeting. Income numbers are used to develop budgets and plans. The smoothing of income can prevent vacilating targets (Beidleman, 1973).

9. Earnings Prediction. Generally accepted accounting principles do not allow for forecasts. Managers may attempt to smooth income so as to provide users with a more efficient tool for predicting future earnings (Barnea, Ronen, Sadan; 1975).

10. Creditor Relations. Creditors look at income variability in determining the riskiness of a loan. A smoothed income stream could lead to lower interest rates or an increased ability of a firm to obtain credit.

11. Stock Price. Managers have a direct interest in stock prices (compensation, stock options) as well as an indirect interest (ease of raising capital, stockholder satisfaction). Capital market theory claims that risk and return are related. More specifically as the risk (variability) of a given asset increases, investors require

higher expected return. High market risk (as measured by beta) may be associated with lower price/earnings ratios (Monsen & Downs, 1965). Accounting income numbers have been shown to have information content for the market (Ball & Brown, 1968). And measures of variability in accounting income numbers have been shown to be related to market risk (Lev & Kunitsky, 1974; Beaver & Manegold, 1975; Beaver, Kettler, & Scholes, 1970). It can be argued that investors incorporate the fact that an income stream is smooth into their valuation process and that consequently income smoothing will have a beneficial effect on stock market prices (Beidleman, 1973).

Appendix II

LIST OF SAMPLE FIRMS

BanCal Tri-State Corp.
BancOhio Corp.
Bank America Corp.
Bank of New York
Bank of Virginia*

Chase Manhattan Corp.
Chemical New York Corp.
CitiCorp.
Cleveland Trust Co.
Continental Illinois National Bank & Trust

Crocker National Corp.
Fidelcor
First Bank System, Inc.
First Chicago Corp.
First International Bancshares, Inc.

First Kentucky National Corporation*
First Pennsylvania Corp.
First National State Bancorporation*
Girard Co.
Lincoln First Banks, Inc.

Manufacturers Hanover Corp.
Marine Midland Banks, Inc.
Mellon National Corp.
J.P. Morgan & Co.
Nortrust Corp.

The National State Bank*
North West Bancorp
Philadelphia National Corp.
Pittsburgh National Corp.
Republic of Texas Corp.

SeaFirst Corp.
Security Pacific Corp.
Southeast Banking Corp.
Texas Commerce Banchares Inc.
Union Bancorp

U.S. Bancorp
Valley National Bank of Arizona
Wachovia Corp.
Wells Fargo & Co.
Western Bancorporation

* Annual reports for only 36 of Fortune's List of 50 largest banks were available when data collection was conducted. As a minimum sample of 40 firms was desired, 4 other banks (indicated by *) were randomly selected from available bank annual reports.

Appendix III

METHODOLOGICAL WEAKNESSES OF EX POST STUDIES

All empirical studies must make some assumptions and face some limitations in design. Any study has individual weaknesses, but more important are limitations shared by studies as a group. Three limitations tended to characterize the cross-sectional design studies;

1. By looking at each year as an individual observation there exists the possibility of confusing maximizing behavior with smoothing behavior (see Copeland, 1968, for an elaboration). Studies by Archibald (1967), Copeland and Licastro (1968), Cushing (1969), Dopuch and Drake (1966), Gagnon (1967), Gordon, Horwitz and Meyers (1966), and White (1970) all encountered this problem.

2. Some smoothing instruments previously investigated have involved a decision on the part of firms which committed the firm to future action. For example, the decision to use deferral rather than flow through for the investment tax credit commits the firm to an allocation procedure which effects income for several years. It is conceivable than an instrument that has a smoothing effect in one year could have a counter-smoothing effect in subsequent years.

   This does not mean that hypothesized smoothing instruments or decisions which have multi-year consequences cannot be used to smooth income. It does mean that if a technique results in a future commitment on the part of management, then the effect of that technique on the future periods should be investigated. This was not done by Gordon, Horwitz and Meyers; Gagnon; Archibald; White; or Cushing.

3. Some past studies classified firms as smoothers or non-smoothers by investigating only the direction of the effect of a hypothesized smoothing instrument on income (i.e., increases or decreases). Failure to consider the magnitude of the effect on income could lead to mis-classification. (See Cushing, 1969 for an elaboration.)

Most of the more recent studies (Barefield and Comiskey, 1972; Beidleman, 1973; Dascher and Malcom, 1970; Barnea, Ronen and Sadan, 1976; Ronen and Sadan, 1975) have adopted one of the two regression designs. Regression designs overcome the problem of possible misclassification inherent in the cross-sectional design and by their very nature consider the magnitude of the effect of the smoothing instrument investigated as well as the direction of the effect. There are however some assumptions and limitations associated with the regression design:

1. If one of the strengths of the regression type design is that it looks at multi-year data as one observation, it is also a potential weakness. Researchers must ask the question of how many years of income figures should be investigated. Studies by Copeland (1968) and Dascher and Malcom (1970) have indicated that investigations of streams of income of different length can result in different conclusions. What length of time period (if any) is optimal for identifying firms which smooth income? Copeland suggests that lengthening the time period looked at will decrease the chance of mis-classifying firms as smoothers or non-smoothers. Yet Copeland's research had numerous design weaknesses which make the results suspect. The issue of the proper length of time to investigate is unresolved.

2. Some models that have been used are incompatible with some of the data. For example, Dascher & Malcom used an exponential detrending model and Beidleman used a logarithmic model. Both models have some intuitive appeal because they are consistent with the idea that firms may desire to increase their level of growth each year. Yet both models are inconsistent with decreasing trends in earnings and both studies had to discard observations where firms showed declining trends. This becomes a problem when it is noted that White (1970) concluded that firms experiencing declining trends in earnings may be the most likely to engage in smoothing activity.

3. Target models have been used by researchers which are inconsistent with the stochastic properties of income numbers. Linear, exponential, market index, industry leader trends have all been used to detrend income streams. Yet research by Ball & Watts (1972) suggests that income streams may best be described by a martingale or submartingale process. Ball & Watts even argue that because of the martingale nature of income numbers attempts by firms to smooth income may result in variability being increased. Gonedes (1972), however, has questioned this conclusion and has outlined the circumstances under which smoothing behavior may prove beneficial.

The implicit assumption of regression designs which use time to detrend earnings is that the expectation of income is a function of time. As Ball & Watts state, this implies that unexpected increases (or decreases) in earnings are temporary and thus should be smoothed away. The martingale nature of income streams however, suggest that such is not the case. Relatively good times do not necessarily follow bad times (and vice versa) so smoothing may be counter productive.

Shank & Burnell (1974), however, have provided evidence that in practice managers <u>strive</u> for a consistent time trend in income. As smoothing is a behavioral phenomena on the part of managers, models which involve trends consistent with income patterns that managers might <u>desire</u> to achieve seem plausible for research purposes.

Before proceeding, two inherent limitations of all ex post type smoothing studies whether cross-sectional or regression type in design, should be mentioned:

1. Ex post studies based on published accounting information are necessarily limited to "visible" smoothing techniques while perhaps the most effective smoothing techniques are those that are invisible to the researcher (e.g., expense vs. capitalization policies).

2. As many researchers (Gagnon, 1967; Kirchheimer, 1968; Schiff, 1968; Zeff, 1966) have noted there are limitations to the conclusions that can be drawn from ex post studies. Published data is at best a reflection of the underlying decision making and motivation of managers. An ex post indication that the use of a potential smoothing technique has resulted in decreased income variability does not "explain" management behavior. The fact that management consciously acted to smooth income can not be concluded. Such results can only indicate that management behaved as if it attempted to smooth income. No motivational connection can be proved (Barnea, Ronen & Sadan, 1976, p. 112). Ex post studies can only talk about appearances, not behaviorial fact.

This issue has relevance for the present study. The argument in looking at marketable securities transactions is not that banks will engage in securities transactions with smoothing as the only relevant consideration. There are no doubt many factors that enter into a decision to trade a security. An ex post analysis can not isolate the effect of the individual factors considered. The argument is, however, that smoothing may be one consideration. An ex post study is a first cut at trying to determine if smoothing is practiced. If the results are such that the effect of securities transactions is to reduce income variability for a significant proportion of sample firms then one can conclude that smoothing behavior can not be ruled out as a factor considered in the decision to trade marketable securities.

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